This volume deals with the technology and industries of the products named, and their analysis, also with the testing of lubricating oils and greases, soaps, glycerine and candles. A very important chapter is that on the waste oils, fats and waxes, and the products derived therefrom.

The reviewer knows of no treatise which deals so thoroughly with this phase of the subject. The contents have been increased by about twenty per cent., the principal additions being made in the sections upon the examination of butter, hydrogenated fats, varnishes, candles and soap. The work is encyclopedic, no omissions being noted, and indispensable to those having to deal with these compounds, or industries, which are among the most important. The reviewer would again take the opportunity to urge the inclusion of an index in each volume, as much increasing its consulting value.

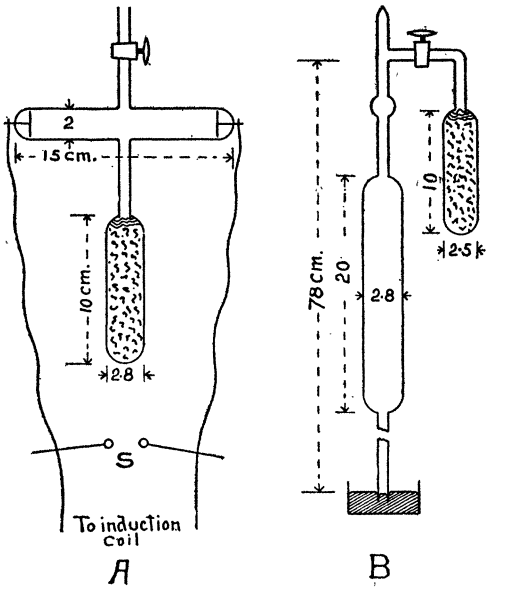
A. H. GILL

SPECIAL ARTICLES

THE ABSORPTION OF AIR BY CHARCOAL COOLED TO THE TEMPERATURE OF LIQUID AIR

THE remarkable absorption of certain gases by charcoal cooled to the temperature of liquid air, first pointed out by Ramsay and Soddy, may be exhibited conveniently by either of two simple pieces of apparatus. The first (*A* in the figure) makes use of the electric discharge as an index of the degree of absorption; while the second (*B* in the figure) indicates the absorption by the barometric column supported in a vertical tube dipping into a bath of mercury.

The general form and dimensions of the discharge-tube and its attached charcoal bulb are indicated in *A*. The volume of the charcoal used should be approximately equal to that of the discharge tube proper. A vent closed by a valve is included. For the experiment to be in its best form the cocoanut charcoal should be freshly burned, and to prevent undue absorption of air when not in use the tube should be partially pumped out and the valve closed. The connections are made as



shown in the figure, in which *S* is an alternative spark gap of about one centimeter length in parallel with the discharge tube. Any induction coil about the laboratory will answer. To operate, open the valve, then close it tightly, thus allowing the pressure within the tube to become atmospheric. On starting the induction coil the spark will pass at *S*. Now gently submerge the charcoal bulb in liquid air. In about one minute the spark at *S* will begin to weaken and a stringy discharge will appear between the electrodes of the discharge tube. Soon the spark at *S* will cease while the tube will be filled with the characteristic Geissler tube glow. In about four minutes the walls of the discharge tube will begin to flouresce, due to the bombardment of cathode rays. The intensity of this fluorescence will rapidly increase and soon the entire tube will be uniformly filled with a beautiful apple-green color. In about one minute more, five minutes from the start, the greenish color will begin to fade and sparking will *reappear* at *S*, showing that the vacuum in the tube is becoming "hard." In short the pressure may thus be reduced from atmospheric to about .001 mm. mercury in five or six minutes with no other agency than that of the absorption

of air by charcoal cooled to the temperature of liquid air.

The second method of showing the absorption of air, due to Dr. L. T. Jones, is at once clear by an inspection of *B* in the figure. The vertical stem, up to the branch leading to the charcoal bulb, should be at least 78 cm. long. This stem may also have an enlargement about half way up as shown. A valve should be included to protect the charcoal when not in use. Before starting the experiment the valve is opened and the tube mounted in a bath of mercury. Liquid air is then applied to the charcoal bulb. The absorption proceeds slowly at first, but soon gains headway as the charcoal cools. The speed that the mercury column acquires as it rises up through and fills the enlargement is surprising. Even with the ratio of volume of tube to charcoal as shown in the figure (approximately 4:1) the mercury column will mount to nearly full atmospheric pressure in the short space of five or six minutes.

Added interest is to perform the two experiments simultaneously.

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August, 1915

Occurrence of the Protozoan, Colacium Multoculata Kent, in Iowa

In making collections of *Daphnia,* and other Entomostraca, on October 31, 1914, the writer discovered a small pond near Iowa City, Iowa, which fairly teemed with *Daphnia* of a striking green color.

Examination of these specimens in the laboratory revealed the cause of the coloration to be myriads of individuals of the Protozoa bearing chromatophores and being attached to the surface of the *Daphnia* completely covering, not only the body proper, but even the appendages in many cases.

These Protozoa yielded themselves readily to identification as belonging to the genus *Colacium*—Flagellates closely related to *Euglena* but differing therefrom in one essential, among others, of having a sedentary attached stage as well as a free-swimming stage. In the sedentary stage the individual zooids are attached by pedicles to some object or, as is more often the case, to some other form of animal life.

Kent (1881) mentions, at the close of his discussion of the *Colacium,* a supplementary species for which he proposes the provisional name of *Colacium multoculata.* It is with his description of this species that the animals under the observation of the writer most favorably compare.

As with Kent the writer demonstrated a very short pedicle and in no case was more than a single individual found on one pedicle. There is a general tendency for the animal to assume a quadrate-elliptical form in outline both when free-swimming and fixed, with an occasional broadening near the distal end. The shape is subject to more or less continual change. The chromatophores are very large and seem to be distributed near the periphery of the cell. Kent describes the presence of from two to four red spots instead of the single one commonly present and from this character proposes the name of the species. By far the most of the specimens examined by the writer possessed but one spot, some half dozen individuals from the many showed from two to four as described. In as much as the differing specimens agreed in all other essential characters they were undoubtedly variations of the same species. The possession of a flagellum by the free-swimming form was amply demonstrated.

Edmondson in his treatise on the Protozoa of Iowa[1] includes *Colacium* in his key to genera but states that no species of this genus has been reported within the state. It is probable that other species closely related to the one forming the subject of this note may be added to the list of Iowa Protozoa.

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Spore Measurements

The usual way of giving measurements of spores as width by length in μ is clear and

[1] Davenport Academy of Sciences, 1906.